Dell PowerConnect W-AirWave 7.3

Server Sizing Guide

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This preface provides an overview of this guide, a list of all documentation available for AirWave 7.3, including contact information for Dell, and includes the following sections:

- "Document Organization" on page 5
- "Note, Caution, and Warning Icons" on page 5
- "Contacting Support" on page 6

Document Organization

This document provides guidelines for purchasing new hardware which hosts AirWave.

NOTE: Dell PowerConnect W-Series AirWave Wireless Management Suite (AWMS), AirWave, and AirWave Management Platform (AMP) refer to the same product set and are used interchangeably.

Table 1 *Document Organization and Purposes*

Chapter	Description
Chapter 1, "Selecting Your Hardware Components" on page 7	Provides an overview of the sizing information.
Chapter 2, "Configuring Your Hardware" on page 11	Details information about the CPU, Disk, and file system configuration of AirWave.
Chapter 3, "Virtualization and Scalability" on page 13	Discusses virtual machines and scaling of AirWave.
Appendix A, "Sizing a Master Console And Failover" on page 15	Includes specifications for Master Console and Failover.

Note, Caution, and Warning Icons

This document uses the following note, caution, and warning icons to emphasize advisories for certain actions, configurations, or concepts:

NOTE: Indicates helpful suggestions, pertinent information, and important things to remember.

CAUTION: Indicates a risk of damage to your hardware or loss of data.

WARNING: Indicates a risk of personal injury or death.

Contacting Support

Table 2 *Web Support*

Web Support	
Main Website	dell.com
Support Website	support.dell.com
Documentation Website	support.dell.com/manuals

This overview chapter includes the following topics:

- "CPU, Memory, and Storage Matrix" on page 7
- "Choosing Your CPU" on page 8
- "Choosing Your Memory" on page 9
- "Choosing Your RAID Controller" on page 9
- "Choosing Your Hard Drives" on page 10

CPU, Memory, and Storage Matrix

The following table lists the recommended specifications for optimum Dell PowerConnect W-AirWave server performance.

Table 3 *Recommended CPU, Memory, and Storage*

Managed Devices	CPU Class	Min. Clock Speed (GHz)	CPUs	AirWave Memory	AirWave Storage	Sustained IOPs Performance 4KB random write	Min. Disk Configura-tion
Pilot 1-25 APs	Single Quad Core Intel® Xeon I3-2100	3.1	1	8 GB	75 GB	30	(1) 15K SAS
100	Single Quad Core Intel® Xeon E3-1220	3.1	1	8 GB	75 GB	60	(1) 15K SAS
200	Single Quad Core Intel® Xeon E3-1240	3.3	1	8 GB	75 GB	120	(1) 15K SAS
500	Single Quad Core Intel® Xeon W3670	3.2	1	12 GB	75 GB	300	(4) 15K SAS in RAID 1+0
1,000	Single Quad Core Intel® Xeon X5687	3.6	1	16 GB	187 GB	600	(6) 15K SAS in RAID 1+0
1,750	Single Quad Core Intel® Xeon X5687	3.6	1	24 GB	275 GB	1,000	(8) 15K SAS in RAID 1+0
2,500	Dual Quad Core Intel® Xeon X5687	3.6	2	32 GB (36 GB optimized**)	375 GB	1,500	(8) 15K SAS in RAID 1+0
5,000	Dual Hex Core Intel® Xeon X5690	3.46	2	64 GB (72 GB optimized**)	600 GB	3,000	(16) 15K SAS in RAID 1+0

** Optimized memory can vary depending on the vendor configuration. For more information, contact Dell support at support.dell.com.

NOTE: Ensure that the disk subsystem can sustain these 4KB random write rates. Sustained sequential write rates will not help because Dell PowerConnect W-AirWave writes are primarily random.

The following table lists the minimum specifications required to run AirWave.

Table 4 *Minimum CPU, Memory, and Storage*

Managed Devices	CPU Class	Min. Clock Speed (GHz)	CPUs	AirWave Memory	AirWave Storage	Sustained IOPs Performance 4KB random write	Min. Disk Configura-tion
Pilot 1-25 APs	Single Quad Core Intel® Xeon I3-2100	3.1	1	4 GB	75 GB	30	(1) 15K SAS
100	Single Quad Core Intel® Xeon E3-1220	3.1	1	6 GB	75 GB	60	(1) 15K SAS
200	Single Quad Core Intel® Xeon E3-1240	3.3	1	6 GB	75 GB	120	(1) 15K SAS
500	Single Quad Core Intel® Xeon W3670	3.2	1	8 GB	75 GB	300	(4) 15K SAS in RAID 1+0
1,000	Single Quad Core Intel® Xeon X5687	3.6	1	12 GB	150 GB	600	(4) 15K SAS in RAID 1+0
1,750	Single Quad Core Intel® Xeon X5687	3.6	1	18 GB	225 GB	1,000	(6) 15K SAS in RAID 1+0
2,500	Dual Quad Core Intel® Xeon X5687	3.6	2	24 GB	300 GB	1,500	(6) 15K SAS in RAID 1+0
5,000	Dual Hex Core Intel® Xeon X5690	3.46	2	48 GB	450 GB	3,000	(16) 15K SAS in RAID 1+0

Dell PowerConnect W-AirWave includes the 64-bit CentOS operating system based on Red Hat Enterprise Linux (RHEL) and is installed by default.

NOTE: If you choose to install RHEL instead of the supplied CentOS, you will need to purchase your own RHEL license and support separately.

Your hardware should incorporate margin for WLAN expansion as well as future AirWave features and modules. These recommended specifications are formulated to keep AirWave running on the same hardware platform for up to three years.

Factors which influence the processing requirements for your AirWave server:

- How many devices will the server manage?
- How often will AMP communicate with these devices?

CAUTION: To ensure hardware capability, purchase server hardware that is certified to be compatible with Red Hat Enterprise Linux 5 (RHEL5).

Choosing Your CPU

For most Dell PowerConnect W-AirWave installations, select high-performance Xeon X or W-series based CPUs.

Scalability testing uses Intel based hardware at this time. See Table 3 for recommendations on CPU selection based on clock speed and core type.

Choosing Your Memory

Dell PowerConnect W-AirWave's memory recommendations scale linearly with the managed device count.

With Airwave servers running at full load for those device counts with a large number of floorplans, the recommended memory usually results in best overall performance.

Best performance is defined by minimal disk reads due to sufficient caching, thus allowing for maximum disk write performance and minimal CPU I/O wait time.

Choosing Your RAID Controller

RAID 1+0 is the ONLY supported RAID configuration for AirWave.

CAUTION: Software RAID and SATA drives are NOT SUPPORTED for any configuration of AirWave.

RAID Configuration Information

For RAID 1+0:

- Dedicated Hardware RAID controller with caching and battery backup or non volatile (NV) cache.
- RAID controller should be configured for Write-Back caching with battery backup (unless NVcache is selected, then Force Write-Back without Battery backup is recommended).
- Individual Drive Caching should be enabled.
- Ensure that all disks are assigned and configured to a single volume.

CAUTION: Improper RAID configuration can result in drastically reduced server performance.

200 Devices and Below

AirWave 100 and 200 models perform well on a single, fast (spindle speed) disk.

500 Devices

RAID1+0 configuration of four (4) or more 15K SAS drives in a single volume with dedicated Hardware RAID controller with minimum 256MB of cache and battery backup.

1,000 Devices

RAID1+0 configuration of four (4) or more 15K SAS drives in a single volume with dedicated Hardware RAID controller with minimum 256MB of cache and battery backup.

1,750 Devices

RAID1+0 configuration of six to eight (6-8) or more 15K SAS drives in a single volume with dedicated Hardware RAID controller with minimum 512MB of cache and battery backup.

2,500 Devices

RAID1+0 configuration of six to eight (6-8) or more 15K SAS drives in a single volume with dedicated Hardware RAID controller with minimum 1GB of cache and battery backup.

5,000 Devices - Non-SSD Drives

RAID1+0 configuration of sixteen (16) or more 15K SAS drives in a single volume with dedicated Hardware RAID controller with minimum 1GB of cache and battery backup.

5,000 Devices - SSD Drives

AWMS 2,500 - 5,000 device installations with SSDs require **Single Level Cell (SLC) Enterprise class SSD drives.**

CAUTION: Do not use Multi Level Cell (MLC) Consumer class drives. Use of MLC drives can result in drastically reduced SSD drive lifespan and data loss/volume failure due to write exhaustion.

A minimum of six (6) Enterprise SSDs in a RAID 1+0 configuration are required (Please see "CPU, Memory, and Storage Matrix" on page 7 for minimum needed storage capacity information). Eight (8) or more SSDs in a RAID 1+0 configuration are recommended.

The target random write 4KB IOP Performance is at minimum 3,000 sustained IOPS for 5,000 device monitoring.

The actual disk IOP requirement can vary depending on the configuration of the Airwave server.

NOTE: If you have any questions regarding hardware compatibility or selection, contact Dell support at **support.dell.com**.

NOTE: AirWave servers servicing more than 2,500 devices require 64-bit OS and AirWave 7.1 or higher. Do not use software RAID systems or SATA disk drives.

Choosing Your Hard Drives

15K SAS drives are the highest performance spinning platter drives available today. Serial ATA and 10K SAS are vastly outperformed by 15K SAS and should not be used in an AirWave server.

You will need to select the appropriately sized hard drive to meet your desired storage volume after taking into account RAID1+0 reduction on overall storage capacity.

RAID1+0 reduces your single volume available drive space by ½ because of the redundancy introduced.An example would be 16x 146GB 15K SAS hard drives in a RAID1+0 volume will result in approximately 1.1 TB of storage space [(16*146GB)/ 2]

SSDs vs 15K SAS

Solid State Drives are becoming more affordable and are being offered as a high performance drive option by many vendors. SSDs offer performance that far outstrips 15K SAS, but at a significant cost premium.

Dell PowerConnect W-AirWave does support deployment on SSD based storage arrays and can take advantage of the high speed disk access and stellar random write performance.

To select an appropriate SSD you'll want to ensure that the SSD is classified as "Enterprise" class. This generally indicates a drive that uses Single Level Cell (SLC) technology versus Multi Level Cell (MLC) technology. SLC technology is required for an AirWave server to avoid unexpected write exhaustion and/or poor performance due to write amplification.

Confirm with your vendor prior to purchasing SSDs that their offerings are appropriate for a 24/7 sustained high random write database server and are not a consumer-grade SSD.

In general, RAID1+0 is still recommended for SSD deployments to allow for the best overall redudancy and performance. Any parity based RAID (5/6/etc) is not recommended.

For additional information, please contact Dell support at support.dell.com.

Chapter 2

Configuring Your Hardware

This chapter explains sizing information for the following topics:

- "CPU Configuration" on page 11
- "Disk Partitioning" on page 11
- "Filesystem Configuration" on page 11

CPU Configuration

Ensure that Power Management is configured for **Maximum Performance**. By default, most vendors configure BIOS to an eco-friendly setting.

Ensure that Memory Operating Mode is configured to **Optimizer Mode**, if available.

Disk Partitioning

Dell PowerConnect W-AirWave automatically partitions the disk subsystem upon installation. You can override these values. Table 5 below lists the default partitioning and provides guidance for more advanced scenarios.

Table 5 *Default Partitions*

Default Partitions	Size
boot	100 MB
swap	4 GB
/	Remainder of disk space

Filesystem Configuration

For Dell PowerConnect W-AirWave, the NOOP File I/O scheduler provides the best random write performance. If you are running Airwave 7.2 or newer, Airwave should automatically manage this setting for you.

To check the currently assigned scheduler (if sda is not your device name, please replace with the correct device name):

```
# cat /sys/block/sda/queue/scheduler
noop anticipatory deadline [cfq] (Sample Output)
```

To configure noop as your preferred scheduler:

```
# echo noop > /sys/block/sda/queue/scheduler
```

And confirm that you change has been applied:

```
# cat /sys/block/sda/queue/scheduler
[noop] anticipatory deadline cfq (Expected Output)
```

Chapter 3

Virtualization and Scalability

This chapter includes the following topics:

- "Virtualization" on page 13
- "Scalability Assumptions" on page 13

Virtualization

Dell PowerConnect W-AirWave can run in a VMWare and Xen virtualized environment. To ensure scalability, dedicate the processing and memory. You must also ensure that the disk subsystem can maintain the IOPS throughput as detailed below.

Most virtualized environments use a shared disk subsystem assuming that each application will have bursts of I/O without a sustained high I/O throughput. AirWave requires a continuous sustained high data I/O rate.

For virtualized environment, use dedicated hardware. If using the specifications outlined in Table 3, the hardware for virtualization should exceed these specifications by 20%.

NOTE: A 20% increase buffer is recommended for virtualized environments. Ensure you allocate enough extra disk space for the OS and swap when partitioning the virtual disk.

Scalability Assumptions

Using the specs outlined in Table 3, scalability tests are based on the following assumptions. Deviations from these assumptions can impact overall scalability of your AirWave server.

Table 6 *Wireless Scalability Test Values*

Category	Value
Average density of client devices per access point	5
Device configuration auditing interval	Daily
Up/Down status polling period (minutes)	5
User data polling period (minutes)	10
Thin AP discovery period (minutes)	15
Device-to-device link polling period (minutes)	20
Device bandwidth polling period (minutes)	10
802.11 counters polling period (minutes)	15
Rogue AP and device location data polling period (minutes)	30
CDP neighbor data polling period (minutes)	60

NOTE: Auditing more than once a day can have a tremendous impact on scalability.

Table 7 *Wired Scalability Test Values*

Category	Value
Ratio of switches/routers to access points	20%
Average port density of switches/routers	36
Read ARP polling period (hours)	8
Read CDP table for device discovery polling period (hours)	8
Read bridge forwarding table polling period (hours)	8
Interface polling period (minutes)	20

Table 8 *VisualRF Scalability Test Values*

Category	Value
Average floor plan size (feet)	62,500
Number of access points per floor plan	20
Number of clients per floor plan	100
Number of attenuation grid cells per floor plan	2,500
Number Rogue devices per floor plan	20
AMP Synchronization timer (minutes)	15
Rogue location timer (minutes)	30
Location calculation timer (min/max/number of samples)	90/360/3

Appendix A

Sizing a Master Console And Failover

Master Console

Table 9 *Master Console Specifications*

Environment Size	CPU Class	Clock Speed (GHz)	CPUs	Total Cores	Memory	Disk Subsystem
Small (2-3 servers)	Quad Core Intel® Xeon® X5687	3.6	1	4	12 GB	(4) 73GB, 15K RPM - RAID 1+0, 146 GB of usable disk space
Large (>3 servers)	Quad Core Intel® Xeon® X5687	3.6	2	8	24 GB	(6) 146GB, 15K RPM - RAID 1+0, 438 GB of usable disk space

Failover Server

The Failover server should be as powerful as the most powerful AMP server that it is monitoring to ensure smooth operation in a failover situation.